Physics 202 MWF10:20 Spring 2006 (Ford)

Name (printed) With Answers

Name (signature as on ID)_____

Lab Section_____

Exam II Chapts. 20–22 in Cutnell and Johnson 6e

Multiple choice questions. Circle the correct answer. No work needs to be shown and no partial credit will be given.

(6 pts) 1. Two resistors, $R_1 = 2\ \Omega$ and $R_2 = 4\ \Omega$, are connected in series to a battery. R_1 is dissipating electrical energy at a rate of 32 W. At what rate is R_2 dissipating electrical energy?

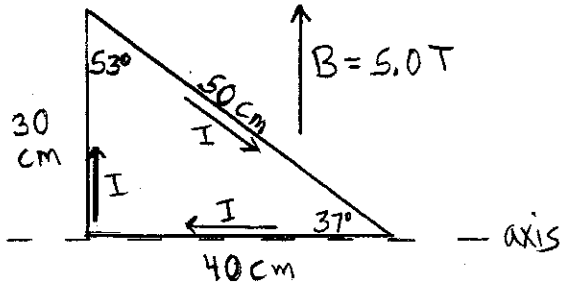
(a) 8 W
(b) 16 W
(c) 32 W
d (d) 64 W
(e) 128 W

(6 pts) 2. Two resistors, $R_1 = 2\ \Omega$ and $R_2 = 4\ \Omega$, are connected in parallel to a battery. R_1 is dissipating electrical energy at a rate of 32 W. At what rate is R_2 dissipating electrical energy?

(a) 8 W
b (b) 16 W
(c) 32 W
(d) 64 W
(e) 128 W

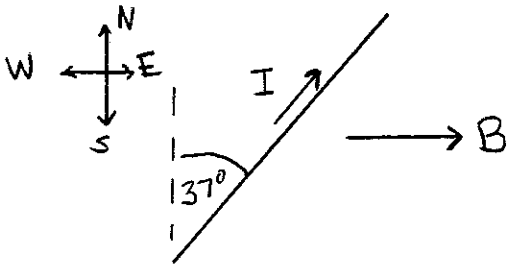
(6 pts) 3. A triangular loop of wire in the plane of the page is pivoted about one edge, as shown in the sketch. The area of the loop is 0.060 m^2. There is a uniform magnetic field $B = 5.0$ T, directed toward the top of the page. The current in the loop is 4.0 A, in the direction shown. The magnitude of the torque applied to the loop by the magnetic field is

(a) zero
(b) 0.72 N·m
(c) 0.96 N·m
d (d) 1.20 N·m
(e) 2.00 N·m



(4 pts) 4. A straight wire carrying current $I = 5.0$ A is in a uniform magnetic field $B = 0.20$ T. The direction of I is 37° east of north and the direction of B is east. What is the magnitude of the force on a 0.040 m section of the wire?

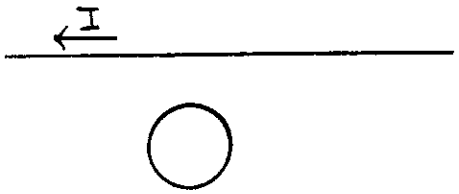
(a) zero
(b) 0.024 N
C (c) 0.032 N
(d) 0.040 N
(e) 1.00 N



(4 pts) 5. In the situation of Question 4, what is the direction of the force on the 0.040 m section of the wire?

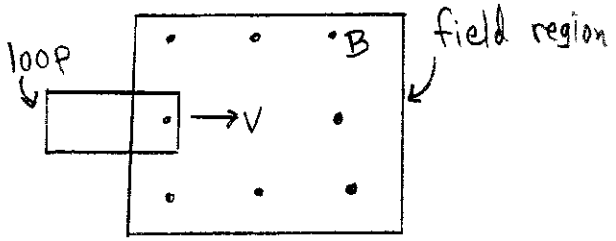
(a) north
(b) south
(c) east
(d) west
e (e) into the page
(f) out of the page
(g) none of these

(6 pts) 6. A long straight wire is carrying current I to the left, as shown. A circular conducting loop is below the wire. If the current I in the wire is increasing, the current induced in the loop is



(a) zero
b (b) clockwise
(c) counterclockwise

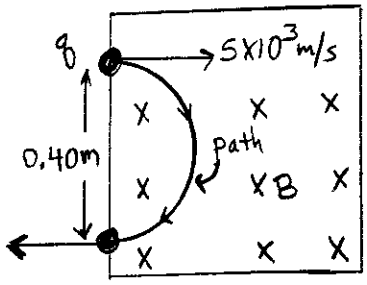
(6 pts) 7. In the magnetic field region shown in the sketch there is a uniform magnetic field directed out of the page. A rectangular conducting loop is being pulled into the region of magnetic field, as shown in the sketch. As the loop enters the magnetic field, the induced current in the loop is



(a) zero
b (b) clockwise
(c) counterclockwise

Show all your work for partial credit. Write your answers in the blanks provided.

(14 pts) 8. A particle of charge q enters a region of uniform magnetic field and travels along the path shown. When the particle enters the magnetic field region its speed is 5.0×10^3 m/s. When the particle emerges from the field is it 0.400 m from the point where it entered. The magnetic field is $B = 0.20$ T and is directed into the page. The mass of the particle is 2.0×10^{-9} kg.



a) What is the speed of the particle when it exits from the field region?

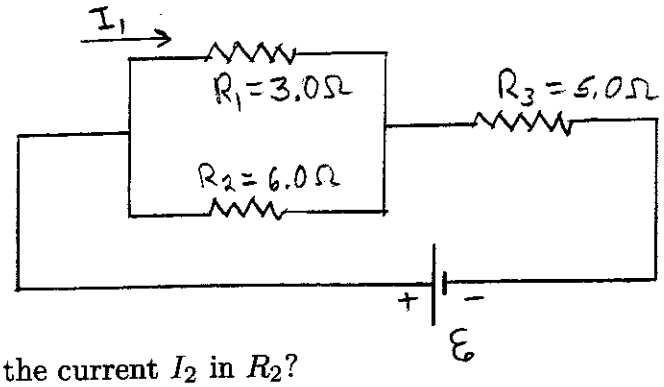
Ans. 5.0×10^3 m/s

b) What are the sign and magnitude of the charge of the particle?

Ans. sign negative

magnitude 2.5×10^{-4} C

(16 pts) 9. Three resistors, $R_1 = 3.0\ \Omega$, $R_2 = 6.0\ \Omega$, and $R_3 = 5.0\ \Omega$, are connected to a battery as shown in the sketch. The current in R_1 is $I_1 = 4.0$ A. What is



a) the current I_2 in R_2?

Ans. 2A

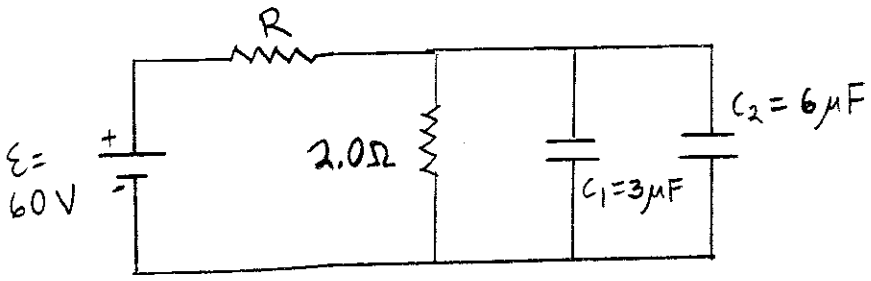
b) the current I_3 in R_3?

Ans. 6A

c) the emf of the battery?

Ans. 42V

(16 pts) 10. Two resistors and two capacitors are connected as shown in the sketch to a battery with emf 60.0 V. When the capacitors have reached their final charge, the charge on C_1 is $q_1 = 18.0 \times 10^{-6}$ C.



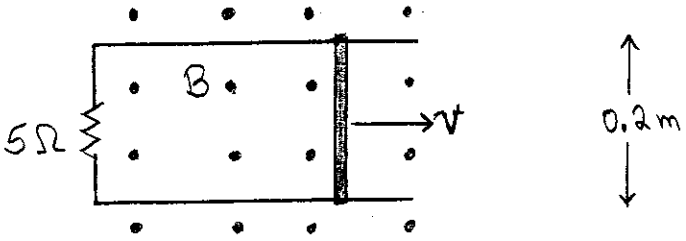
a) What is the final charge on C_2?

Ans. 36 μC

b) What is the resistance R?

Ans. 18 Ω

(16 pts) 11. In the circuit shown in the sketch a conducting bar 0.20 m long slides toward the right on frictionless rails. The 5.0 Ω resistor is the only resistance in the circuit. There is a uniform magnetic field of 0.40 T directed out of the page, as shown.



(a) Is the induced current in the circuit clockwise or counterclockwise?

Ans. clockwise

(b) When the speed v of the bar is $v = 20$ m/s, what is the magnitude of the induced current?

Ans. 0.32A

(c) What are the magnitude and direction of the external force that must be applied to the bar to keep it moving at a constant speed of $v = 20$ m/s?

Ans. magnitude 0.0256 N

direction to the right